

REMARKS:

Reconsideration of the rejections is respectfully requested.

Applicant gratefully acknowledges the designation of claim 16 as containing allowable subject matter. However, as discussed below, Applicant respectfully submits that the rejection to the other claims should be withdrawn.

The status of the claims is as follows:

Amended:	None
Previously Cancelled:	1-11
Previously Presented:	12-22
Currently Amended	15
Pending:	12-22

Claim 15 is amended to match the form of claims 17 and 18. It is respectfully submitted that support is apparent.

Claim Rejections - 35 U.S.C. §103(a)

Base Rejection Based on TDB

The rejections in the Office Action are all under 35 U.S.C. §103(a), with each rejection depending on teachings said to be derived from IBM Technical Disclosure Bulletin, 17(3): 862-3, August, 1974 ("TDB"). The rejection of claims 12 and 15 is said to follow from the disclosures of the TDB directly. Applicant respectfully submits that if this rejection of claims 12 and 15 is in error, then all the remaining rejections founded on the premises of the rejection must also fail.

The Office Action asserts that the TDB teaches:

- ♦ pressing indentations of desired conductor patterns into the PVA coated side of a green sheet by hot stamping using an embossed metal plate under temperature and pressure;
- ♦ filling the indentation by screen printing by squeegeeing conductive paste of metal powder and organic vehicle into the indentations;
- ♦ stacking green sheets; and
- ♦ co-firing.

Assuming for the sake of argument that the above is correct, it is nonetheless further correct that, in the TDB, the conductive paste is always covered with filler paste (4 or 8), and not by green tape. This is because the voids created by the filler paste are the intended purpose of the TDB disclosure ("To lower the effective dielectric constant between conductors, air gaps or pockets of low dielectric material are formed in selected areas between conductors").

The present claims recite that the filled channel is covered with a second green tape. The filled channel is not covered with a filler paste designed to create an air gap. Thus, for the claims to be obvious, there must be a motivation in the prior art to modify the teachings of the TDB. And since that modification would remove the air gaps, it would render the prior art invention unsatisfactory for its intended purpose. Thus, as set forth in MPEP §2143 (citing In re Gordon), there cannot be a suggestion or motivation for the change.

It is worth noting that the TDB only teaches applying metal paste to channels in the context of appropriately placing insulating voids. Without the voids, the TDB would not motivate using channels.

Also, the TDB does not teach or suggest screen printing to fill the channels. An objective indication of the significance of this defect is found in the very same TDB, since screen printing is taught when not filling channels,

Accordingly, Applicant respectfully submits that the rejection is in error and should be withdrawn. Since all the rejections are based on the premises of the rejection to claims 12 and 15, all should be withdrawn.

Conclusion

In light of these amendments and remarks, it is respectfully submitted that the Amendment should be entered, the rejections should be withdrawn, and that the application is in condition for allowance.²

Respectfully submitted,



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Enclosure: Better copy of IBM Technical Disclosure Bulletin, 17(3): 862-3, August, 1974 than is believed to be in the PTO record.

² **FEE DEFICIENCY**

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LOW DIELECTRIC CONSTANT POCKETS IN MULTILAYER CERAMIC MODULES

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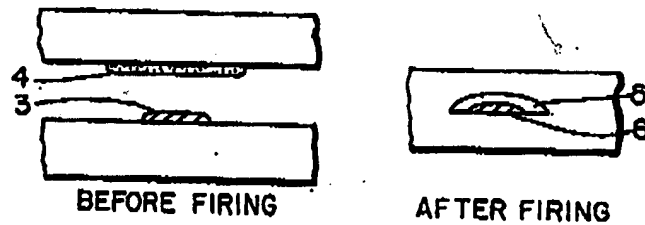


FIG. 1

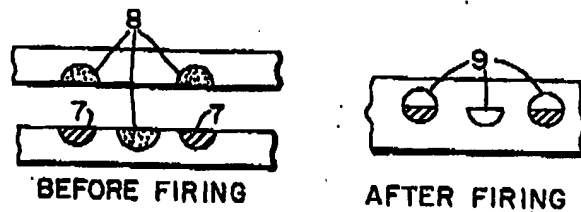


FIG. 2

The insulator between conductors in multilayered ceramic packages for high-speed integrated circuits should have a low dielectric constant (about 2 to 4) in order to meet certain electronic requirements. To lower the effective dielectric constant between conductors, air gaps or pockets of low dielectric material are formed in selected areas between the conductors.

To form such low dielectric areas in a multilayer ceramic module, for example, first a metal paste 3 with metal particles is screen-printed on the ceramic green sheets in the desired patterns, as shown in Fig. 1. On the adjacent surfaces of the next green sheets in the package a mirror image of the pattern is screen-printed, using a filler paste 4 which contains materials which do not volatilize at the laminating temperature, but which volatilize completely at the sintering temperature

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LOW DIELECTRIC CONSTANT POCKETS IN MULTILAYER CERAMIC MODULES -- Continued

of the ceramic module, such as a solution of alpha methyl styrene, organic thickeners, etc. The paste may also contain refractory particles of a low dielectric constant material but no metals or compounds yielding metals during firing. The filler-paste pattern matches the metal-paste pattern except that there is no filler paste on the sites where interconnections are to be made to other levels of the package. The areas of the filler-paste preferably are larger than the metal-paste areas. One filler-paste area may also cover several metal-paste areas. After drying, laminating and firing, an air gap 5 results directly over the top and the edges of the internal conductor 6, reducing the average (effective) dielectric constant of the insulator between conductors.

Alternately, recesses in the desired conductor pattern may be formed in the ceramic green sheet by electron beam cutting, mechanically stamping and similar methods, as shown in Fig. 2. The cut recesses are filled with the metal paste 7 by squeegeeing, etc. Then, other recesses are formed adjacent to the metal-paste-filled recesses 7 on the same ceramic green sheet and/or on the adjacent surface of the next ceramic green sheet, and filled with the filler paste 8. After drying, laminating and firing, air gaps 9 result, as in the Fig. 1 example, to reduce the average dielectric constant of the insulator.

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